Iangreyite \( \text{Ca}_2\text{Al}_7(\text{PO}_4)_2(\text{PO}_3\text{OH})_2(\text{OH},\text{F})_{15}\cdot8\text{H}_2\text{O} \)

**Crystal Data:** Hexagonal.  **Point Group:** 32. As hexagonal tablets (sometimes warped), to 0.4 mm, exhibiting forms \{001\} and \{100\}; in subparallel stacked aggregates.

**Physical Properties:**  **Cleavage:** Perfect, \{001\}.  **Fracture:** Irregular.  **Tenacity:** Brittle; somewhat flexible.  **Hardness:** 3  **D (meas.)** = 2.46(3)  **D (calc.)** = 2.451

**Optical Properties:** Transparent to translucent.  **Color:** Colorless to white or cream, white, yellowish, or light pink.  **Streak:** White.  **Luster:** Vitreous, pearly (aggregates).

**Optical Class:** Uniaxial (+). \( \omega = 1.544(2) \quad \epsilon = 1.554(2) \)

**Cell Data:** **Space Group:** P321.  \( a = 6.988(1) \quad c = 16.707(3) \quad Z = 1 \)

**X-ray Powder Pattern:** Silver Coin mine, Nevada, USA.

16.739 (100), 2.967 (45), 2.219 (19), 6.054 (18), 1.744 (17), 5.687 (13), 1.896 (13)

**Chemistry:**

<table>
<thead>
<tr>
<th>Na(_2)O</th>
<th>K(_2)O</th>
<th>CaO</th>
<th>FeO</th>
<th>BaO</th>
<th>SrO</th>
<th>MgO</th>
<th>PbO</th>
<th>CuO</th>
<th>MnO</th>
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<tbody>
<tr>
<td>0.27</td>
<td>1.01</td>
<td>7.62</td>
<td>0.16</td>
<td>0.45</td>
<td>0.10</td>
<td>0.34</td>
<td>0.00</td>
<td>0.06</td>
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<td>0.04</td>
<td>0.45</td>
<td>11.28</td>
<td>0.82</td>
<td>0.26</td>
<td>1.13</td>
<td>0.04</td>
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<td>0.00</td>
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<tr>
<td>ZnO</td>
<td>Al(_2)O(_3)</td>
<td>SiO(_2)</td>
<td>As(_2)O(_5)</td>
<td>P(_2)O(_5)</td>
<td>SO(_3)</td>
<td>F</td>
<td>- O = F</td>
<td>H(<em>2)O(</em>{diff})</td>
<td>Total</td>
</tr>
<tr>
<td>0.10</td>
<td>31.80</td>
<td>0.19</td>
<td>0.00</td>
<td>25.90</td>
<td>0.40</td>
<td>9.53</td>
<td>2.81</td>
<td>24.87</td>
<td>100.00</td>
</tr>
</tbody>
</table>

(1) Silver Coin mine, Nevada, USA; average of 7 electron microprobe analyses, \( \text{H}_2\text{O} \) by difference, presence of \( \text{H}_2\text{O}, \text{OH}, \text{and PO}_4 \) confirmed by IR and Raman spectroscopy; corresponding to \( \text{Ca}_{9.42}\text{K}_{0.22}\text{Na}_{0.09}\text{Ba}_{0.03}\text{Sr}_{0.01}\text{Al}_{6.51}\text{Mg}_{0.09}\text{Fe}_{0.02}\text{Cu}_{0.01}\text{Zn}_{0.01}\text{P}_{3.81}\text{F}_{5.24}\text{H}_{30.21}\text{O}_{33.76} \).

(2) Krásno ore district, Horní Slavkov, Czech Republic; average of 12 electron microprobe analyses, corresponding to \( \text{Ca}_{2.12}\text{K}_{0.10}\text{Na}_{0.01}\text{Ba}_{0.02}\text{Sr}_{0.12}\text{Al}_{0.28}\text{Mg}_{0.01}\text{Fe}_{0.12}\text{Cu}_{0.08}\text{Zn}_{0.01}\text{P}_{3.60}\text{Si}_{0.43}\text{F}_{4.65}\text{H}_{29.62}\text{O}_{34.35} \).

**Occurrence:** A weathering product derived from the breakdown of phosphate minerals (e.g. F-rich perhamite, “fluorapatite”) by acidic ground waters derived from the oxidation of sulfide minerals.

**Association:** Meurigite-Na, plumbogummite, kidwellite, lipscombite, strengite, chalcosiderite, wardite, leucophosphate, wavelite, goethite, barite, quartz, and F-rich perhamite (Silver Coin mine, Nevada, USA); “fluorapatite” (Czech Republic).

**Distribution:** From the Silver Coin mine, Valmy, Iron Point district, Humboldt County, Nevada, USA; at the 5th level of the Huber shaft, Krásno ore district, near Horní Slavkov, Czech Republic.

**Name:** Honors Dr. Ian Edward Grey (b. 1944), formerly Chief Research Scientist at CSIRO Minerals, Melbourne, Australia, for his contributions to mineralogy, crystallography and the minerals-processing industry.

**Type Material:** Mineral Sciences Department, Natural History Museum of Los Angeles County, California, USA (57661 and 62519); Department of Mineralogy and Petrology, National Museum Prague, Czech Republic (P1P 20/2009).